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THE RESPIRATORY FUNCTION OF THE BLOOD.

The Respiratory Function of the Blood. By Joseph Barcroft, F.R.S. Pp. x+320. Cambridge University Press, 1914.) Price 18s. net.

THE title of this book gives but an inadequate idea of the scope of its contents. As the author states in the Preface, it is really an account of his "physiological ventures," and consists mainly of the researches undertaken by himself and his pupils, with slighter references to cognate work by other observers. The wealth of new facts and ideas which are here presented bears striking witness to the important part played in the advance of science by the discovery of a new technique. In practically all the investigations here presented it was necessary to determine the gaseous contents of minute quantities of blood or other fluids, so that the discoveries here made may be said to be the direct outcome of Haldane's invention of a method for the gaseous analysis of small quantities of blood—a method since perfected and elaborated to such an extent by the author of this book as to be identified with him. Armed with this new technique, he was able to attack a number of capital problems connected with the behaviour of oxygen in the blood, its uptake in the lungs, and the conditions of its utilisation by the tissues, with an ease and accuracy which previously was impossible.

This book, however, is not a mere reprint of Barcroft's physiological papers. In presenting his results, he wisely abandons the chronological for a logical order. In the first part he begins with a description of the physical and chemical characters of hæmoglobin and the determination of its combining power for oxygen in relation to its iron content. The constancy of the figures obtained in his latest experiments for oxygen capacity and iron content is regarded by the author as almost convincing proof that the combination is chemical in the strict sense of the term. He then discusses the oxidation curve of oxyhæmoglobin and the influence of temperature, electrolytes and acids on the curve. An important result arrived at is that the variations which have been described in the dissociation-curves in the blood of different animals may be ascribed to differences in the salt-content of the blood-corpuscles, which determine varying degrees of the aggregation of the colloidal hæmoglobin molecule.

In part ii. he proceeds to discuss what significance these facts have for the normal life of the animal. The question of the factors which deter-

mine the supply of oxygen to the tissues during rest and activity, involves difficult physiological experimentation on the exchange of gases between tissues and blood in voluntary muscle, heart, adrenals, pancreas, kidney and liver. From these results we are led on to another series in which the oxygen intake of the tissues is used as a criterion of the activity of the tissue-cells. In this way he is able to throw a welcome light on the nature of some of the phases of renal activity—activity of the cells being assumed as responsible for urinary formation when an increased flow of urine is associated with an increased uptake of oxygen by the kidney. A chapter on the metabolism of the blood itself (which, except in abnormal circumstances, is shown to be negligible) is followed by an account of the mechanism by means of which the supply of oxygen to the tissues may be regulated according to their needs. Prominent among these mechanisms is the local production of lactic acid and possibly other metabolites, which not only have a vaso-dilator action, so increasing the blood-flow through the part, but also, by their action on the dissociation-curve of hæmoglobin, favour the transfer of oxygen from oxyhæmoglobin to the tissues.

In the next chapter he describes a bold attempt made by him in conjunction with Verzar to determine the head of pressure driving oxygen from the blood to the tissues, using as his criterion the effect of variations in the oxygen-supply on the amount of this gas taken up by the tissues.

Under normal conditions, the blood has only a certain time to take up oxygen in the lungs and to give up oxygen in the tissues, viz. the duration of its transit through the capillaries of lungs and tissues respectively. An investigation of the rates of combination and dissociation of oxygen and hæmoglobin enables the author to show that the physical conditions which determine the form of the dissociation-curve outside the body are sufficient to account for the changes taking place within the body. This investigation naturally leads on to a discussion on the much debated question as to the mechanism of the uptake of oxygen in the lungs. A very impartial account is given of the views and investigations of Bohr, Haldane, Krogh, and Hartridge. His final conclusion is in favour of the view according to which the process is determined by the physical conditions existing in the lungs, though he points out that the question cannot be regarded as finally settled until the results obtained by Haldane and others on Pike's Peak have been reinvestigated by Hartridge's methods or have received some adequate explanation.

The third part of the work deals with the dis-

sociation-curve of the hæmoglobin as an indicator of the reaction of the blood, and contains a wealth of interesting observations on the effects of diet, exercise, residence at high altitudes, and finally, certain pathological conditions associated with acidosis. The author is to be congratulated on the production of a book interesting not to physiologists only. The lively personal note of the narrative is a happy novelty in a physiological monograph, and will enable those of his readers who have not worked with him to appreciate and, in a measure, to partake of the genial optimism of the author.

E. H. S.

GYROSCOPIC MOTION.

An Elementary Treatment of the Theory of Spinning Tops and Gyroscopic Motion. Second edition. By H. Crabtree. Pp. xv+193. (London: Longmans, Green and Co., 1914.) Price 7s. 6d. net.

IN this, the second edition of Crabtree's admirable book, the text and paging of the first edition have been followed, but additions have been made where necessary, so that more recent developments may be dealt with. The first edition was noticed in NATURE (August 12, 1909, p. 182), so that it is not necessary to do more now than refer to the additional matter. The two monorail systems of Brennan and Schilowsky are illustrated and described. It may be mentioned that each of these derive their stability from a gyrostatic system, the action of which is independent of the forward motion of the car, so that the stability exists whether the car is moving forwards or backwards or is at rest, and in this respect differs entirely from the systems more recently invented by Dr. Gray.

There is a full discussion of the Anschütz gyro compass, but this is the same as that which is given in the manual published by Messrs. Elliot Bros., having been translated for them by the author and his colleagues. The writer of this notice hoped to have found also a description of the Sperry gyro compass, which differs in certain respects very materially from its forerunner, the Anschütz. A discussion by the author of the relative merits of the two systems where they differ would have been very illuminating. Unfortunately, this instrument is not mentioned. Other matters ably dealt with in the appendices are the swerving of golf-balls and the drifting of rifled projectiles, both subjects on which amazing nonsense is often written.

There is a statement in the earlier part of the book on the skidding of motor-bicycles, with which the present writer does not agree. Seeing that the back tyre is being constantly impelled to slip

longitudinally on the ground by successive explosions in the cylinder, more especially where a rigid chain drive is employed, or where the fly-wheel of the engine is insufficient, and that a longitudinal slip will start a side slip, there is abundant cause for the side-slipping capacity of these machines, without looking to more subtle causes. Briefly, the author explains that in consequence of the gyrostatic action of the flywheel a transverse couple must be applied in order to make the flywheel's plane of rotation change when the machine is describing a curve. In order to apply this, the rider and machine must lean over to a very small extent more than would be necessary otherwise. So far so good; the transverse couple is caused by the weight of the whole combination of machine and rider acting vertically downwards, and a corresponding reaction at the road acting vertically upwards, and the arm of the couple is the excess of the horizontal distance between the centre of gravity and the wheel base due to the extra leaning. The transverse force on the road, which alone gives rise to side slip, is unchanged.

It is satisfactory to find that there is a sufficient demand for a book of such thoroughness as this to have called for a second edition in a comparatively short time.

C. V. BOYS.

BRITISH FLOWERING PLANTS.

British Flowering Plants. Illustrated by Three Hundred Full-page Plates, reproduced from Drawings by Mrs. Henry Perrin. With Detailed Descriptive Notes and an Introduction by Prof. G. S. Boulger. Vol. i. Pp. xlv+ plates. (London: Bernard Quaritch, 1914.)

MRS. PERRIN'S book, of which the first volume is before us, is essentially a book for the use of ladies and those who take a dilettante interest in botany and flowers. It is unfortunate, therefore, that it is of such a weight that its presumed readers may scarcely have the strength or energy to handle the bulky tomes.

Not only are the plates heavily loaded with plaster of Paris, but the large quarto pages of text are of almost equal solidity. If the contents of the book were of any scientific interest or formed a real addition to knowledge, the great bulk of the volume would be a matter of sincere regret; we cannot, however, foresee any particular use for the book, except that its handsome back may adorn the shelves of an expensive library, and can only deplore that the money expended on this production could not have been put to some object of definite botanical value.

The paintings, which afford the *raison d'être* of the book, are on the whole good, though in